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AIR QUALITY SURVEY IN THE VICINITY OF DOMTAR CONSTRUCTION MATERIALS LTD. BRANTFORD, ONTARIO

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PREPARED FOR
WEST-CENTRAL REGION
MINISTRY OF THE ENVIRONMENT

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1.0 Executive Summary

A mobile air monitoring unit from the Air Resources Branch performed an ambient air quality study in October 1987 in the vicinity of the Domtar Construction Materials Plant in Brantford. Area residents have complained about odorous emissions from the production of asphalt roofing materials.

Air monitoring was done for 138 organic compounds and several common contaminants such as sulphur dioxide, nitrogen oxides and carbon monoxide. Of the monitored compounds with Ontario standards or guidelines, none of the measured concentrations exceeded those threshold values.

Two distinct odours typical of an asphalt related process were noted during each downwind sampling period but the compounds causing the odour could not be identified.

Sommaire

Une unité mobile de surveillance de l'air de la Direction des ressources atmosphériques a effectué, en octobre 1987, une étude de la qualité de l'air ambiant dans les environs de l'usine de matériaux de construction de la société Domtar, à Brantford. Les résidents du secteur se plaignaient parce que la fabrication d'asphalte pour toitures dégageait des odeurs.

L'unité a recherché 138 composés organiques et plusieurs polluants courants comme l'anhydride sulfureux, les oxydes d'azote et le monoxyde de carbone. Aucune des concentrations mesurées ne dépassait les seuils fixés dans les normes et les lignes directrices de l'Ontario.

Deux odeurs distinctes qui évoquent un procédé quelconque utilisé dans la fabrication d'asphalte ont été observées pendant chacune des périodes d'échantillonnage sous le vent, mais il a été impossible de déterminer quels composés au juste étaient à leur origine.

2.0 Introduction

During the month of October, 1987 the vicinity surrounding the Domtar Construction Materials Plant, located in Brantford, was the subject of an ambient air quality study. The plant manufactures asphalt roofing materials and local residents have complained about odorous emissions relating to Domtar's manufacturing process. (Refer to figure 1 for a scheme of the production process.)

Responding to a request from the West Central Region, Ontario Ministry of the Environment, a mobile air monitoring unit (MAMu #2) from the Air Resources Branch carried out air quality monitoring at several locations outside plant property during the month of October.

It had previously been determined by Ministry of the Environment personnel that the odours in question had violated the Environmental Protection Act and abatement measures were recommended to rectify the situation.

The purpose of this study was to assess the presence of any of a large number of organic compounds in the ambient air, and to determine the concentrations of any contaminants which could cause odour problems or exceed Ontario's standards for half-hour average concentrations.

3.0 Survey Technique

3.1 Overview of the Instrumentation of Mobile Air Monitoring Unit #2

Instrumentation contained in MAMU #2 consists of analyzers for the monitoring of total hydrocarbons (THC), methane (CH_4), non-methane hydrocarbons (TH-M), total reduced sulphur compounds (TRS) - including hydrogen sulphide (H_2S), sulphur dioxide (SO_2), nitrogen oxides (NOx), nitrogen dioxide (NO_2), nitric oxide (NO), carbon monoxide (CO), ozone (O_3)and elemental mercury (Hg_2 - not used in this survey). An additional 138 organics compounds were analyzed using a gas chromatograph (GC) which was coupled to a volatile organic compounds preconcentrator. These organics were grouped into the following categories: alkanes, alkenes, alkynes, aromatics, chlorinated hydrocarbons and total hydrocarbons.

Meteorological instrumentation is present on MAMU #2 which consists of instruments designed to monitor wind speed and direction, temperature, humidity, barometric pressure and solar radiation. Table 1 lists additional information concerning the above instrumentation.

3.2 Monitoring Technique

All analytical instruments were calibrated each day before monitoring using the appropriate sources listed in Table 1. Sampling periods were consistent at 30 minutes when using the gas chromatograph, but continuous sampling using all other instruments was carried out for all monitoring locations.

Locations chosen for the sampling of ambient air were either directly upwind or downwind of suspected sources of odour, depending on accessibility and weather conditions. The majority of samples were taken in the residential areas surrounding plant property between the hours of 11:00 and 16:00 on weekdays. No sampling was carried out overnight, nor was any done on plant property itself. Figure 2 shows the plant property and the locations chosen for downwind monitoring in the surrounding vicinity.

In order to improve the accuracy of results, exhaust hoses and a sampling hose and funnel were often employed to minimize self-contamination of the samples by MAMu #2's generators and nearby traffic.

4.0 Results and Discussion

Table 2 provides a summary of all monitoring periods and locations. Tables 3,4 and 5 summarize all data collected using the gas chromatograph. Table 6 contains data of common contaminants measured in the air.

As previously stated, the purpose of this study was to analyze for the possible presence of any chemical compounds that could be responsible for the odours emanating from Domtar Inc. The presence of two distinct odours, both typical of an asphalt related manufacturing process were noted by the crew of the monitoring unit and local residents, during each downwind sampling period.

Out of 138 organic compounds and 10 common air contaminants no specific compounds were targeted as sources of the odour. Upon comparison and reduction of all the data accumulated during the six downwind runs and one upwind run, no applicable Ontario guidelines or standards were exceeded in reference to ambient air quality.

4.1 Organics

It must be noted that although the gas chromatograph did not confirm the presence of any compounds definitely responsible for the asphalt odours, the total hydrocarbons analyzer recorded numerous spikes of non-methane compounds in the range of 2-5 ppm. These were recorded during sampling when strong odours were noted by the MAMu #2 crew.

This suggests that some organic compounds were present; however their identity was not determined by the gas chromatograph. An explanation for this observation is related to the constituents of the type of asphalt used by Domtar.

Asphalt is a by-product of crude petroleum. Some components of crude petroleum are separated by a distillation process using temperatures up to 300°C, whereby the fractions consisting of light heating oils are removed leaving a heavy residue. This is further processed to achieve whatever grade of asphalt is required. Asphalts are distinguished from other fractions derived from crude oils by the high concentration of alkyl-substituted, fused-ring structures (for example; condensed aromatic or naphthenic nuclei joined by methylene rings). The molecular weights of these compounds are in the range of 1000-2500. These compounds will have a very high boiling point and are not possible to detect by the presently used analytical methods.

Table 3 contains the organic compound concentrations for each of the seven samples analyzed on the gas chromatograph. Tables 4 and 5 summarize the data in terms of average and maximum concentrations, number of times detected and compound class. It can be seen that most of the total organics identified were alkanes and aromatics. The odours encountered in the vicinity of Domtar Inc. are likely those caused by the compounds which MAMu #2 could not detect.

4.2 Common Contaminants

Table 6 summarizes data from five downwind sites and one upwind monitoring site. From the maximum half hour average concentrations listed, it should be noted that none exceeded any provincial guidelines or standards.

Concentrations of slight significance were found for CO and NO. These readings are probably a consequence of passing traffic and small contributions from motors used as part of the production processes at Domtar.

The data from the last run listed in Table 6 corresponds to a monitoring period upwind of the Domtar plant. Upon comparison of all other downwind runs with this upwind run, it can be seen that only very small concentrations of the 10 common contaminants are present in ambient air as a result of Domtar's production processes. These data confirm previous continuous sampling results for sulphur dioxide and total reduced sulphur compounds during November 26, 1986 to January 7, 1987, when very low concentrations were also measured by the West Central Region at a fixed monitoring station near the Domtar plant.

APPENDIX

FIGURE 1

Production of Asphalt Shingles

FELT ROLL - Cellulose based (waste paper and woodchips)

Saturator - Roll is sprayed with asphalt (450°F) and impregnated with hot saturant

HOT SATURATED SHEET

Coating Rolls - 40% coating asphalt (450°F) and 60% limestone (380°F) are applied to the sheet

- mineral granules are then applied on one side and talc is applied on the other side

Rollers - press granules onto hot sheet
- cool sheet with H_2O sprayer

COOLED SHEET

Cutting Machine - shingles are separated, wrapped and labelled

FINISHED PRODUCT

Table 1

Instrumentation of Mobile Air Monitoring Unit #2

INSTRUMENT	MANUFACTURER	ANALYTICAL TECHNIQUE	FULL SCALE SENSITIVITY
THC, CH_4, TH-M Analyzer	Ingenieur-Productions Gruppe Muclen (IPM) RS - t	Dual Flame Ionization	50 ppm THC (as CH_4)
H_2S, SO_a, NO_x sources	Hartmann & Brown Pruf gas generator	N/A	N/A
TRS Analyzer	Monitor Labs 8850 c/w ML 8770	Fluorescence	0.5 ppm H_2S
NO_x, NO_2, NO Analyzer	Monitor Labs 8840	Chemi-Lumineoscence	1.0 ppm NO_x (as NO_2)
CO Analyzer	Thermo Electron P48	Gas Filter Correlation	100 ppm CO
O_3 source/ Analyzer	Dasibi 1003-AAS	UV absorption	1.0 ppm O_3
CO & THC sources	Matheson	Compressed Gas	N/A
Pure Air Generator	Aadco-model 737	-	-
Hg Analyzer	Scintrex-model HGP-2	UV absorption	8 ug/m^3
Gas Chromatograph	HP 5880 Dual Capillary Column	Flame ionization detector	as set by calibrations for C_3-C_{13}

Meteorological Instrumentation

Instrument	Manufacturer	Scale
Wind Speed	Lambrecht GmBH	km/hr
Wind Direction	Lambrecht GmBH	degrees
Temperature	Weather Measure (WM) T621	degres Celsius
Humidity	WH-HM-11P	absolute and %
Barometic pressure	WH-BM70-B242	millibars
Solar Radiation	WH Star Pyranometer	milliwatts/cm^2

Table 2

Monitoring Periods and Locations

Site #	Date	Time	Wind Direction	Location	Comments
1	Oct. 6	11:50-12:20	SW-W @ 15-20 km/hr	Usher St. 300 m DW Domtar	Primary Asphalt Odour Secondary
2	Oct. 6	13:49-14:19	S-SE @ 20-25 km/hr	Usher St. at Rushon St.	Secondary Asphalt Odour
3	Oct. 20	12:24-12:54	E @ 10-15 km/hr	Albion St. at St. James St.	Primary + Secondary Asphalt Odours
4	Oct. 20	14:04-14:34	E @ 10-15 km/hr	Albion St. at Henrietta St.	Primary + Secondary Asphalt Odours
4	Oct. 20	15:08-15:38	E @ 10-15 km/hr	Albion St. at Henrietta St.	Primary + Secondary Asphalt Odours
5	Oct. 21	12:07-12:37	NW-N @ 4-8 km/hr	CNR Property 300 m SE Domtar	Asphalt Odour
6	Oct. 21	13:57-14:27	N @ 4-6 km/hr	St.Paul St. at King George Dr.	Upwind

Weather Conditions

Date	Conditions
Oct. 6	Partly Cloudy, 11°C
Oct. 20	Overcast, 10°C, Variable Winds
Oct. 21	Overcast, Rain, 5°C

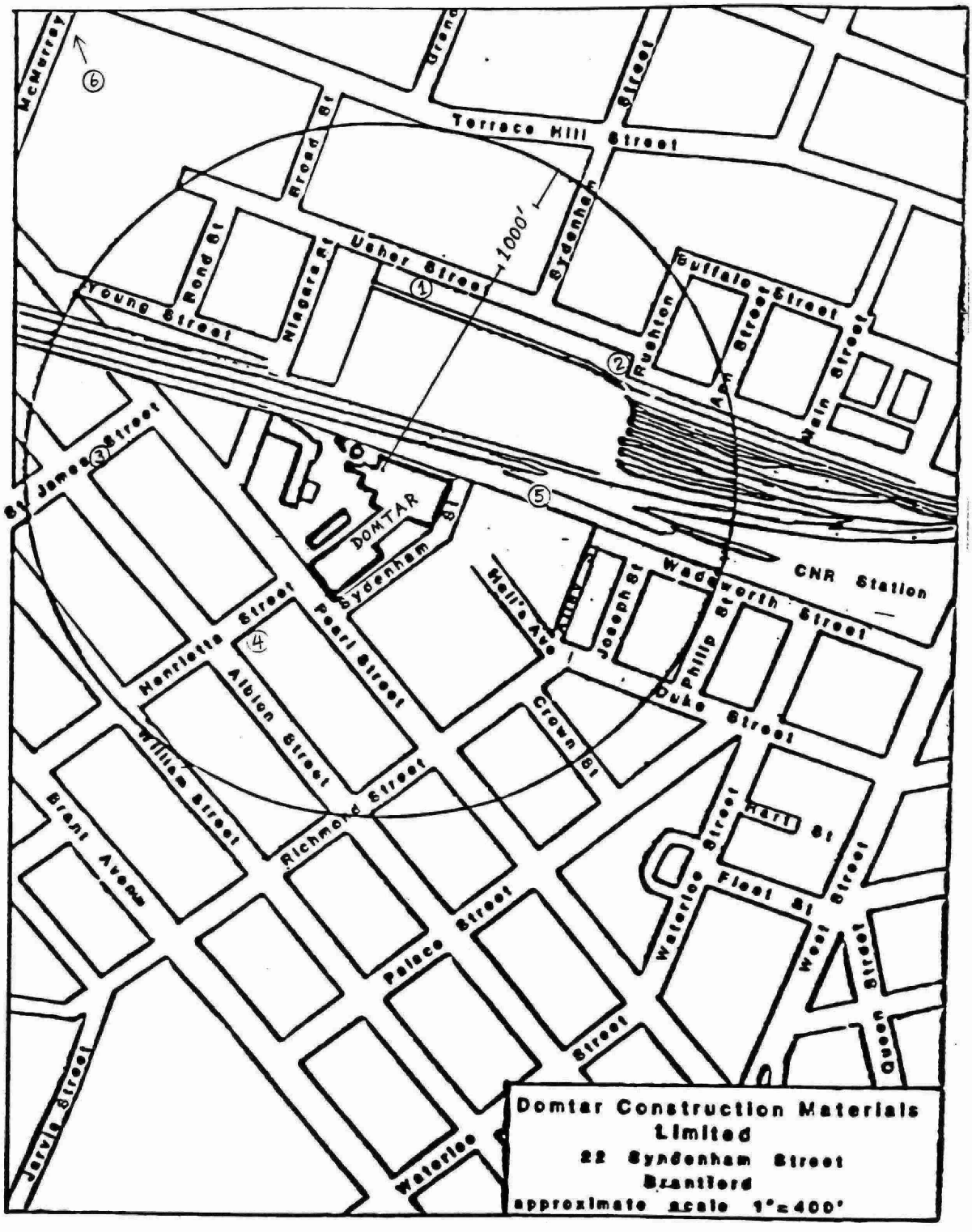


Figure 2. Domtar property and surrounding residential area.

TABLE 3

GC BRANTFORD 1987 DATA
(all values in ug/m3)

	Wind:		DW	DW	DW	DW	DW	DW	UW
	Cartridge:		CART 1	CART 1	CART 1	CART 1	CART 1	CART 1	CART 1
	Duration:		1149-1219	1348-1418	1224-1254	1404-1434	1508-1538	1207-1237	1357-1427
	Date of Analysis:		OCT 6	OCT 6	OCT 20	OCT 20	OCT 20	OCT 21	OCT 21
	Start of Analysis:		12:24	14:22	12:58	14:38	15:46	12:44	14:31
	Compound	Class							
1	PROPANE	1	10.8	2.9	6.0	9.0	8.9	11.8	3.9
2	PROPADIENE	3							
3	PROPYNE	5							
4	CYCLOPROPANE	2							
5	2-METHYLPROPANE	1	6.5	2.9	4.6	13.2	10.0	12.7	5.2
6	CHLOROETHENE	8							
7	1-BUTENE	3			2.6	7.4	4.9		
8	1,3-BUTADIENE	3							
9	BUTANE	1	25.8	9.8	14.3	45.0	37.6	43.4	18.4
10	1-BUTYNE	5							
11	CHLOROETHANE	7							
12	3-METHYL-1-BUTENE	3							
13	2-METHYLBUTANE	1	27.0	8.0	11.0	32.0	28.2	38.3	12.3
14	2-METHYL-1-BUTENE	3	1.7			3.1	2.8	2.7	
15	PENTANE	1	19.4	6.0	6.0	18.2	15.9	20.6	7.3
16	2-METHYL-1,3-BUTADIENE	3	1.3			1.1		2.0	
17	trans-2-PENTENE	3	2.1		1.4	4.1	3.5	4.4	1.5
18	cis-2-PENTENE	3	1.1			2.1	1.8	2.2	

19 DICHLOROMETHANE	7							
20 2-METHYL-2-BUTENE	3	3.9		1.9	6.4	5.5	7.1	2.1
21 2,2-DIMETHYLBUTANE	1	2.0			1.6	1.5	2.0	
22 trans-1,2-DICHLOROETHENE	8							
23 3-METHYL-1-PENTENE	3							
24 4-METHYL-1-PENTENE	3							
25 CYCLOPENTANE	2	2.7		1.1	2.3	2.1	3.0	1.3
26 2,3-DIMETHYLBUTANE	1	3.3		1.2	3.1	2.8	4.0	1.3
27 2-METHYLPENTANE	1	13.9	3.2	4.3	11.3	10.3	14.2	4.6
28 3-METHYLPENTANE	1	8.5	2.1	2.9	6.5	5.9	8.1	2.9
29 1-HEXENE	3							
30 cis-1,2-DICHLOROETHENE	8							
31 2-CHLOROBUTANE	7							
32 HEXANE	1	13.1	3.2	4.1	9.3	8.0	10.6	3.7
33 1-CHLORO-2-METHYLPROPANE	7							
34 TRICHLOROMETHANE	7							
35 trans-3-HEXENE	3							
36 3-CHLORO-2-METHYLPROPENE	8							
37 METHYLCYCLOPENTANE	2	3.6	1.0	1.6	3.4	2.7	3.6	1.3
38 2,2-DIMETHYLPENTANE	1							
39 1,2-DICHLOROETHANE	7							
40 2,4-DIMETHYLPENTANE	1	1.6			1.5	1.3	2.4	0.7
41 1,1,1-TRICHLOROETHANE	7			4.1				
42 2,2,3-TRIMETHYLBUTANE	1							
43 1-CHLOROBUTANE	7							
44 BENZENE	6	12.8	4.3	6.6	11.8	8.5	17.6	7.2
45 TETRACHLOROMETHANE	7							
46 3,3-DIMETHYLPENTANE	1							
47 CYCLOHEXANE	2							
48 2,3-DIMETHYLPENTANE	1	2.1			1.9	1.7	3.5	1.0
49 2-METHYLHEXANE	1	4.9		1.7	3.9	3.2	4.6	
50 CYCLOHEXENE	4							

51	DIBROMOMETHANE	7						
52	1,2-DICHLOROPROPANE	7						
53	3-METHYLHEXANE	1	5.7	1.1	2.0	4.2	3.4	4.9	1.7
54	2,3-DICHLOROPROPENE	8						
55	TRICHLOROETHENE	8						
56	2,2,4-TRIMETHYLPENTANE	1	3.6		2.0	4.1	3.5	4.5	
57	1-HEPTENE	3						
58	HEPTANE	1	5.3		2.0	4.3	3.2	3.3	1.4
59	trans-2-HEPTENE	3						
60	METHYLCYCLOHEXANE	2	1.8		1.4	3.8	2.8	1.8	
61	2,2-DIMETHYLHEXANE	1						
62	ETHYLCYCLOPENTANE	2						
63	4-METHYLCYCLOHEXENE	4						
64	2,5-DIMETHYLHEXANE	1				0.7	0.6	0.9	
65	1-CHLOROPENTANE	7				1.2			
66	1,1,2-TRICHLOROETHANE	7							
67	2,3,4-TRIMETHYLPENTANE	1	1.5			1.9	1.5	2.7	1.3
68	TOLUENE	6	23.8	25.8	13.6	17.4	13.4	19.6	10.5
69	1,3-DICHLOROPROPANE	7							
70	2-METHYLHEPTANE	1	2.0		1.2	3.8	2.9	2.2	
71	4-METHYLHEPTANE	1							
72	c-1,3-DIMETHYLCYCLOHEXANE	2				1.4	1.1		
73	3-METHYLHEPTANE	1							
74	1,2-DIBROMOETHANE	7							
75	1,1-DIMETHYLCYCLOHEXANE	2							
76	1-OCTENE	3							
77	trans12DIMETHYLCYCLOHEXAN	2							
78	trans-4-OCTENE	3							
79	TETRACHLOROETHENE	8							
80	c-1,4-DIMETHYLCYCLOHEXANE	2							
81	OCTANE	1	2.7		1.0	4.5	2.6	1.8	
82	trans-2-OCTENE	3							

83	cis12DIMETHYLCYCLOHEXANE	2						
84	CHLOROBENZENE	9						
85	ETHYLCYCLOHEXANE	2						
86	1-CHLOROHEXANE	7				1.7	1.5	
87	ETHYLBENZENE	6	4.7	3.6	3.0	3.8	3.1	3.3	2.0
88	M,P-XYLENE	6	14.0	13.6	9.2	11.4	9.0	10.1	6.5
89	4-METHYLOCTANE	1	1.9			3.1	1.7	1.2	
90	2-METHYLOCTANE	1	1.7			2.8	1.5	1.2	
91	3-METHYLOCTANE	1				2.8	1.3		
92	STYRENE	6							
93	1,4-DICHLOROBUTANE	7							
94	o-XYLENE	6	5.7	4.3	2.8	4.3	3.2	3.5	2.2
95	1,1,2,2-TETRACHLOROETHANE	7							
96	1,2,3-TRICHLOROPROPANE	7							
97	1-NONENE	3				2.4			
98	trans-1,4-DICL-2-BUTENE	8							
99	NONANE	1	5.2			8.8	3.4	1.8	
100	ISOPROPYLBENZENE	6							
101	2-CHLOROTOLUENE	9							
102	3-CHLOROTOLUENE	9							
103	4-CHLOROTOLUENE	9							
104	PROPYLBENZENE	6	1.4					1.2	
105	3-ETHYLTOLUENE	6	3.8	1.6	1.2	2.9	1.6	2.8	1.8
106	4-ETHYLTOLUENE	6						1.6	
107	1,3,5-TRIMETHYLBENZENE	6	3.5			1.8	1.2	2.0	1.1
108	2-ETHYLTOLUENE	6	1.5			1.3		1.3	
109	tert.BUTYLBENZENE	6				1.8	1.1	1.8	
110	1,2,4-TRIMETHYLBENZENE	6	7.3	3.0	2.3	6.2	3.9	6.2	4.0
111	tert.BUTYLCYCLOHEXANE	2							
112	1,3-DICHLOROBENZENE	9							
113	(CHLOROMETHYL)BENZENE	9							
114	1-DECENE	3							

115	1,5-DICHLOROPENTANE	7						
116	isoBUTYLBENZENE	6						
117	sec.BUTYLBENZENE	6						
118	DECANE	1	4.3			5.6	2.2	2.0
119	3-(CHLOROMETHYL)HEPTANE	7						
120	1,2,3-TRIMETHYLBENZENE	6	2.3			2.2	1.0	1.7
121	1ISOPROPYL4METHYLBENZENE	6						
122	1,2-DICHLOROBENZENE	9						
123	INDAN	6						
124	BUTYLCYCLOHEXANE	2						
125	1,3-DIETHYLBENZENE	6						
126	1,4-DIETHYLBENZENE	6						
127	BUTYLBENZENE	6	1.7			1.5		1.7
128	1,2-DIETHYLBENZENE	6						
129	transDECAHYDRONAPHTHALENE	6						
130	cis-DECAHYDRONAPHTHALENE	6						
131	UNDECANE	1	4.0		1.1	1.4		1.3
132	1235-TETRAMETHYLBENZENE	6	1.7					
133	1234-TETRAMETHYLBENZENE	6	2.3					
134	1,3-DIISOPROPYLBENZENE	6						
135	1234TETRAHYDRONAPHTHALENE	6						
136	1,4-DIISOPROPYLBENZENE	6						
137	NAPHTHALENE	6						
138	DODECANE	1	4.8					1.1

Total Compounds Identified	51	26	35	56	48	52	27
Total # of Peaks	84	33	44	86	67	75	39
Total Area of Peaks	11335	3630	4096	11387	8319	11206	4080
Area of Identified Peaks	9175	3188	3546	9310	7118	9276	3273
Area % Identified Peaks	81	88	87	82	86	83	80

Total Organics (ug/m3)	286.4	96.4	118.0	310.9	237.6	306.1	106.9
Alkanes (ug/m3)	181.5	39.1	65.3	204.3	162.9	205.0	65.5
Cycloalkanes (ug/m3)	8.2	1.0	4.1	12.6	10.2	8.4	2.5
Alkenes (ug/m3)	10.2	0.0	5.9	26.6	18.4	18.5	3.7
Cycloalkenes (ug/m3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkynes (ug/m3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aromatics (ug/m3)	86.5	56.3	38.7	66.2	46.0	74.3	35.2
Chlorinated Alkanes (ug/m3)	0.0	0.0	4.1	1.2	0.0	0.0	0.0
Chlorinated Alkenes (ug/m3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorinated Aromatics (ug/m3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Benzene:Ethylbenzene	2.7	1.2	2.2	3.1	2.8	5.3	3.5
Toulene:Etylbenzene	5.0	7.1	4.6	4.6	4.4	5.9	5.2
Xylene:Ethylbenzene	4.2	4.9	4.0	4.2	4.0	4.1	4.3

TABLE 4

GC BRANTFORD 1987 DATA

(30 minute samples)

	Compound	Class	Number of times detected	AVERAGE (ug/m3)	MAXIMUM (ug/m3)
1	PROPANE	1	7	7.6	11.8
2	PROPADIENE	3			
3	PROPYNE	5			
4	CYCLOPROPANE	2			
5	2-METHYLPROPANE	1	7	7.8	13.2
6	CHLOROETHENE	8			
7	1-BUTENE	3	3	4.9	7.4
8	1,3-BUTADIENE	3			
9	BUTANE	1	7	27.7	45.0
10	1-BUTYNE	5			
11	CHLOROETHANE	7			
12	3-METHYL-1-BUTENE	3			
13	2-METHYLBUTANE	1	7	22.4	38.3
14	2-METHYL-1-BUTENE	3	4	2.6	3.1
15	PENTANE	1	7	13.3	20.6
16	2-METHYL-1,3-BUTADIENE	3	3	1.5	2.0
17	trans-2-PENTENE	3	6	2.8	4.4
18	cis-2-PENTENE	3	4	1.8	2.2
19	DICHLOROMETHANE	7			
20	2-METHYL-2-BUTENE	3	6	4.5	7.1
21	2,2-DIMETHYLBUTANE	1	4	1.8	2.0
22	trans-1,2-DICHLOROETHENE	8			
23	3-METHYL-1-PENTENE	3			
24	4-METHYL-1-PENTENE	3			
25	CYCLOPENTANE	2	6	2.1	3.0
26	2,3-DIMETHYLBUTANE	1	6	2.6	4.0
27	2-METHYLPENTANE	1	7	8.8	14.2
28	3-METHYLPENTANE	1	7	5.3	8.5
29	1-HEXENE	3			
30	cis-1,2-DICHLOROETHENE	8			
31	2-CHLOROBUTANE	7			
32	HEXANE	1	7	7.4	13.1
33	1-CHLORO-2-METHYLPROPANE	7			
34	TRICHLOROMETHANE	7			
35	trans-3-HEXENE	3			
36	3-CHLORO-2-METHYLPROPENE	8			
37	METHYLCYCLOPENTANE	2	7	2.5	3.6
38	2,2-DIMETHYLPENTANE	1			
39	1,2-DICHLOROETHANE	7			

40	2,4-DIMETHYLPENTANE	1	5	1.5	2.4
41	1,1,1-TRICHLOROETHANE	7	1	4.1	4.1
42	2,2,3-TRIMETHYLBUTANE	1			
43	1-CHLOROBUTANE	7			
44	BENZENE	6	7	9.8	17.6
45	TETRACHLOROMETHANE	7			
46	3,3-DIMETHYLPENTANE	1			
47	CYCLOHEXANE	2			
48	2,3-DIMETHYLPENTANE	1	5	2.0	3.5
49	2-METHYLHEXANE	1	5	3.7	4.9
50	CYCLOHEXENE	4			
51	DIBROMOMETHANE	7			
52	1,2-DICHLOROPROPANE	7			
53	3-METHYLHEXANE	1	7	3.3	5.7
54	2,3-DICHLOROPROPENE	8			
55	TRICHLOROETHENE	8			
56	2,2,4-TRIMETHYLPENTANE	1	5	3.5	4.5
57	1-HEPTENE	3			
58	HEPTANE	1	6	3.2	5.3
59	trans-2-HEPTENE	3			
60	METHYLCYCLOHEXANE	2	5	2.3	3.8
61	2,2-DIMETHYLHEXANE	1			
62	ETHYLCYCLOPENTANE	2			
63	4-METHYLCYCLOHEXENE	4			
64	2,5-DIMETHYLHEXANE	1	3	0.7	0.9
65	1-CHLOROPENTANE	7	1	1.2	1.2
66	1,1,2-TRICHLOROETHANE	7			
67	2,3,4-TRIMETHYLPENTANE	1	5	1.8	2.7
68	TOLUENE	6	7	17.7	25.8
69	1,3-DICHLOROPROPANE	7			
70	2-METHYLHEPTANE	1	5	2.4	3.8
71	4-METHYLHEPTANE	1			
72	c-1,3-DIMETHYLCYCLOHEXANE	2	2	1.3	1.4
73	3-METHYLHEPTANE	1			
74	1,2-DIBROMOETHANE	7			
75	1,1-DIMETHYLCYCLOHEXANE	2			
76	1-OCTENE	3			
77	trans12DIMETHYLCYCLOHEXAN	2			
78	trans-4-OCTENE	3			
79	TETRACHLOROETHENE	8			
80	c-1,4-DIMETHYLCYCLOHEXANE	2			
81	OCTANE	1	5	2.5	4.5
82	trans-2-OCTENE	3			
83	cis12DIMETHYLCYCLOHEXANE	2			
84	CHLOROBENZENE	9			
85	ETHYLCYCLOHEXANE	2	2	1.6	1.7
86	1-CHLOROHEXANE	7			
87	ETHYLBENZENE	6	7	3.4	4.7
88	M,P-XYLENE	6	7	10.5	14.0
89	4-METHYLOCTANE	1	4	2.0	3.1
90	2-METHYLOCTANE	1	4	1.8	2.8
91	3-METHYLOCTANE	1	2	2.1	2.8
92	STYRENE	6			

93	1,4-DICHLOROBUTANE	7			
94	o-XYLENE	6	7	3.7	5.7
95	1,1,2,2-TETRACHLOROETHANE	7			
96	1,2,3-TRICHLOROPROPANE	7			
97	1-NONENE	3	1	2.4	2.4
98	trans-1,4-DICL-2-BUTENE	8			
99	NONANE	1	4	4.8	8.8
100	ISOPROPYLBENZENE	6			
101	2-CHLOROTOLUENE	9			
102	3-CHLOROTOLUENE	9			
103	4-CHLOROTOLUENE	9			
104	PROPYLBENZENE	6	2	1.3	1.4
105	3-ETHYLTOLUENE	6	7	2.2	3.8
106	4-ETHYLTOLUENE	6	1	1.6	1.6
107	1,3,5-TRIMETHYLBENZENE	6	5	1.9	3.5
108	2-ETHYLTOLUENE	6	3	1.3	1.5
109	tert.BUTYLBENZENE	6	3	1.6	1.8
110	1,2,4-TRIMETHYLBENZENE	6	7	4.7	7.3
111	tert.BUTYLCYCLOHEXANE	2			
112	1,3-DICHLOROBENZENE	9			
113	(CHLOROMETHYL)BENZENE	9			
114	1-DECENE	3			
115	1,5-DICHLOROPENTANE	7			
116	isoBUTYLBENZENE	6			
117	sec.BUTYLBENZENE	6			
118	DECANE	1	4	3.5	5.6
119	3-(CHLOROMETHYL)HEPTANE	7			
120	1,2,3-TRIMETHYLBENZENE	6	4	1.8	2.3
121	1ISOPROPYL4METHYLBENZENE	6			
122	1,2-DICHLOROBENZENE	9			
123	INDAN	6			
124	BUTYLCYCLOHEXANE	2			
125	1,3-DIETHYLBENZENE	6			
126	1,4-DIETHYLBENZENE	6			
127	BUTYLBENZENE	6	3	1.6	1.7
128	1,2-DIETHYLBENZENE	6			
129	transDECAHYDRONAPHTHALENE	6			
130	cis-DECAHYDRONAPHTHALENE	6			
131	UNDECANE	1	4	1.9	4.0
132	1235-TETRAMETHYLBENZENE	6	1	1.7	1.7
133	1234-TETRAMETHYLBENZENE	6	1	2.3	2.3
134	1,3-DIISOPROPYLBENZENE	6			
135	1234TETRAHYDRONAPHTHALENE	6			
136	1,4-DIISOPROPYLBENZENE	6			
137	NAPHTHALENE	6			
138	DODECANE	1	2	3.0	4.8

Total Compounds Identified	42	56
Total # of Peaks	61	86
Total Area of Peaks	7722	11387
Area of Identified Peaks	6412	9310
Area % Identified Peaks	84	88

Total Confirmed Organics	201	289
Total Upper Limits	11	26
Total Organics (ug/m3)	208.9	310.9
Alkanes (ug/m3)	132.0	205.0
Cycloalkanes (ug/m3)	6.7	12.6
Alkenes (ug/m3)	11.9	26.6
Cycloalkenes (ug/m3)	0.0	0.0
Alkynes (ug/m3)	0.0	0.0
Aromatics (ug/m3)	57.6	86.5
Chlorinated Alkanes (ug/m3)	0.8	4.1
Chlorinated Alkenes (ug/m3)	0.0	0.0
Chlorinated Aromatics (ug/m3)	0.0	0.0
Benzene:Ethylbenzene	3.0	5.3
Toulene:Etylbenzene	5.3	7.1
Xylene:Ethylbenzene	4.2	4.9

TABLE 5

GC INFORMATION

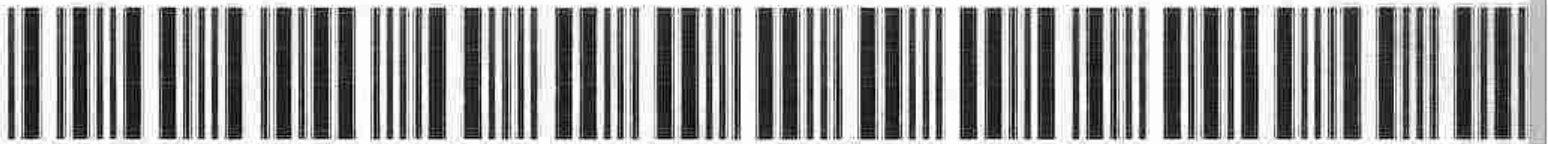
Compound Class	Compound Description
1	Alkanes
2	Cycloalkanes
3	Alkenes
4	Cycloalkenes
5	Alkynes
6	Aromatics
7	Chlorinated Alkanes
8	Chlorinated Alkenes
9	Chlorinated Aromatics

Table 6

SUMMARY OF BRANTFORD COMMON CONTAMINANT DATA

MAXIMUM ½ HOUR AVERAGE

DATE	SITE	CO	TRS	THC	SO_2	Non-CH4	Methane	NOx	NO_2	NO	Ozone
Units		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
OCT 6 Max Average	1	4.2	0.004	1.9	0.007	1.2	0.7	0.05	0.04	0.01	0.033
OCT 6 Max Average	2	0.8	0.002	1.3	0.005	0.8	0.5	0.05	0.05	0.005	0.039
OCT 20 Max Average	3	1.1	0.007	1.4	0.005	0.7	0.7	0.07	0.04	0.03	0.013
OCT 20 Max Average	4	1.2	0.002	1.9	0.005	1.2	0.7	0.05	0.03	0.02	0.010
OCT 21 Max Average	5	2.6	0.004	1.0	0.005	0.6	0.4	0.09	0.04	0.05	0.004
OCT 21 Max Average	6 UW	1.5	0.003	0.7	0.005	0.4	0.3	0.06	0.03	0.03	0.010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